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# China Report

SCIENCE AND TECHNOLOGY

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JPRS-CST-86-036

5 SEPTEMBER 1986

# CHINA REPORT

## SCIENCE AND TECHNOLOGY

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## NATIONAL DEVELOPMENTS

### SPACE TECHNOLOGY SPIN-OFF PRODUCTS FIND WAY TO CIVILIAN MARKET

OW250111 Beijing XINHUA Domestic Service in Chinese 0011 GMT 24 Jul 86

[Report by reporter Zhang Gaopeng and correspondent Xu Lidong]

[Text] Shanghai, 24 Jul (XINHUA)--While developing and producing astronautics and military equipment, Shanghai's astronautics industry has also made great efforts to manufacture marketable civilian goods, thus becoming a new base in China for integrated scientific research and production of military and civilian products.

Shanghai's astronautics industry has a large number of experienced scientists and technicians who are knowledgeable in new and advanced technology. Owing to these advantages, the industry has made significant contributions to China's astronautics development and defense. Of the 18 satellites China has launched, Shanghai's astronautics industry took part in the launching of 9. Shanghai, whose carrier rockets [launch vehicles] have been used many times to launch the nation's artificial satellites, has also worked with fraternal units in successfully launching three different satellites with a single rocket to conduct space physical surveys, making China one of the few countries in the world possessing the technology to launch several satellites with a single rocket. The "Long March No 3" carrier rocket developed with Shanghai's participation was successfully used to launch China's first stationary orbit experimental communications satellite and the operational communications and broadcast satellite. Shanghai is now ready to undertake the launching of commercial satellites for foreign firms. In the course of developing and manufacturing carrier rockets since the 1970's, Shanghai's astronautics industry has also produced many advanced new products and achieved a series of major successes in scientific research.

While developing astronautics and military equipment, Shanghai's astronautics industry has also made great efforts to develop marketable civilian products, thus gradually becoming an industry with enterprises producing military and civilian goods. Currently, the industry has already set up, or is setting up, 26 assembly lines producing civilian goods, and is able to mass produce over 80 kinds of goods in seven major categories; namely, radio and television sets, telecommunications equipment, meters and gauges, medical equipment, computers, mechanical equipment, and electric appliances. The yearly output

has exceeded 2 million units, sets, and pieces. Of the civilian goods, 8 have won national silver awards, and 25 have won awards from the Ministry of Astronautics Industry and the Shanghai Municipal Government for their outstanding quality.

In the course of developing civilian products, Shanghai's astronautics industry has given special attention to developing new products that embody modern technology. Over the past several years, the industry has developed and produced China's first electron microscope with 800,000 x magnification, the first educational robot, the first blood rheometer, and the first electronic warning system, as well as a ground system with different types of antennas to receive satellite signals and large radio and television audio systems. Certain products have been put on the world market.

The development of military-civilian enterprises has greatly invigorated Shanghai's astronautics industry. During the past 5 years, the industry's annual industrial output value and profit taxes have increased by an average of 40 and 23.6 percent respectively. Currently, over 90 percent of the industry's output value is derived from the production of civilian goods.

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CSO: 4008/1109

## NATIONAL DEVELOPMENTS

### WU MINGYU ON REFORM OF S&T SYSTEM, 'SPARK PLAN'

Tianjin JISHU SHICHANG BAO in Chinese 4 Mar 86 p 1

[Article: "Vice Minister Wu Mingyu of the State Science and Technology Commission Discusses Reforms in S&T Systems and the 'Spark Plan' at a First Meeting"]

[Text] During a recent writers' conference held jointly by the China Scientific Popularization Work Society, the China Scientific Popularization Correspondents Society, the Beijing Municipality Scientific Popularization Work Society and the Beijing Municipality Scientific Popularization Correspondents Society, Vice Minister Wu Mingyu [0702 2494 3842] of the State Science and Technology Commission [SSTC] gave a report entitled "An Introduction to Reforms in S&T Systems and the 'Spark Plan.'"

Comrade Wu Mingyu introduced the current situation in progress in reforms in S&T systems in China. He said that reforms in S&T systems should focus on two things: The first is to reform administrative expenditure allocation systems and the second is to popularize and extend specialized job appointment systems. He described the positive role and great significance of extending specialized job appointment systems. He also said that work in this area may encounter several problems during preliminary extension and should be complemented with a system of waiting for appointments, and that this work should be done as quickly as possible to encourage the rational circulation of personnel.

Comrade Wu Mingyu introduced 10 work items in implementation of the "spark plan" at the present time: developing factory-type breeding and animal husbandry that concentrates advantages; developing intensive processing and comprehensive utilization of special rural products; extracting and utilizing small amounts of mineral products; matching products to large industries; developing new types of small commodities and new technical applications; developing housing construction materials systems in market towns and rural areas; building a group of advanced production lines adapted to township and town enterprises; helping relevant areas to establish export commodity base areas; assisting comprehensive development of mountainous areas, coastal areas and low-yield regions; and training technical staffs and enterprise management personnel. Comrade Wu Mingyu described policies toward intellectuals at the present time.

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CSO: 4008/2085



## NATIONAL DEVELOPMENTS

### INCREASED TECHNOLOGY EXPORTS URGED

Tianjin JISHU SHICHANG BAO in Chinese 4 Mar 86 p 1

[Article: "Take Action To Expand Technology Exports; Open Up Foreign Technology Markets; A New Line of Work Is Underway; There Are Broad Prospects for Exporting Large Amounts of Industrial Technologies"]

[Text] Implementation of the Seventh 5-Year Plan during 1986 has permitted China to begin exporting technology. This is a new area of work and the relevant departments and units have explored ways to open up foreign technology markets and are preparing to formulate the appropriate measures and methods.

China has exported more than 30 lines of technology to foreign countries since 1980 and over the past few months alone has transferred Vitamin C ketone group [gulong] acid technology to the [Luoshi] Company in Switzerland, emulsified dynamite production technology to Sweden's Nobel Company and special Chinese character coding system technologies to Italy's [Haolihuode] Company. Adequate attention to technology exports, however, remains to be seen in all areas. There have been major improvements in scientific and technical standards in China over the past few years. More than 20,000 important scientific research achievements have been made and more than 1,000 projects have received major invention awards from the state. In 1985 alone, 1,700 S&T projects received national level scientific and technical progress awards. Moreover, many industrial technologies are attracting the attention of several nations, particularly in the Third World. The establishment of a patent system in China has encouraged the enthusiasm of the masses for invention and innovation. More than 9,000 patent applications had been submitted within China up the end of 1985, and they are an important source of technology exports. According to analysis done in the relevant quarters, China has major potential and broad prospects for technology exports. The focus of China's exports will be industrial technologies, and some laboratory technologies also should be exported selectively. There are abundant sources and mature conditions for industrial technologies and they also will encourage product exports. Some new scientific and technical achievements will be exported and it is expected that they will be rather attractive to the developed nations. Exports of these technologies, however, should be done with an eye to the development situation within China. In principle, any technology that can

be developed and used to make products in China should be developed at home. For those which cannot be developed in China because of such things as investments, techniques, equipment and other reasons, we should encourage their export, but we also should pay attention to using contracts to protect the technologies in foreign countries.

All of the relevant departments now are engaged in study and discussion of such things as how to break into foreign technology markets, how to strengthen management of technology exports and other questions to formulate the appropriate policies and methods and to provide protection for exported technologies and encourage technology exports. The Ministry of Finance and the China Patent Bureau have joined forces to set up a Patent Fund to encourage units that own technologies to apply for foreign patents and provide a partial solution to technology exporting units with shortages of foreign exchange that cannot afford to apply for foreign patents.

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## NATIONAL DEVELOPMENTS

### COMMENTARY SEES TECHNOLOGY AS 'SPECIAL COMMODITY'

Tianjin JISHU SHICHANG BAO in Chinese 4 Mar 86 p 1

[Staff commentary: "Allow Chinese Technology To Go Out Into the World"]

[Text] According to relevant data records, the rise of technical trade and the appearance of technology markets in the world has gone on for several hundred years. Over the past 10 years and more, development of the world technological revolution has created a new situation in technology markets and the developmental pace of technical trading has greatly exceeded that of commodity trading. The technologies of many nations are competing to enter technology markets. Although China has exported some technologies since 1980, China's potential for technology exports cannot be compared with the current situation in world trade.

Because many people have not paid sufficient attention to technology as a special type of commodity and its value, although we have engaged actively in international technical exchanges, we have not been concerned with the compensated transfer of technologies. There are other comrades who have underestimated our own capabilities by taking note only of China's backward technological situation while they have neglected to be concerned with China's scientific and technological progress and improvement over the past several years, so they have not been concerned with definite and specific advantages in many new inventions and technical achievements. The development of reforms in economic systems and S&T systems in China over the past few years have led to an upsurge in enthusiasm for invention and innovation among S&T personnel. Tens of thousands of S&T achievements have burst up like spring bamboo after a rain. Some have taken note of the fact that large amounts of China's industrial technologies have been welcomed in several developing nations, and many of them are discussing projects with us now. Some new inventions and achievements have been very attractive to developed nations, including 29 items developed at Birmingham in England and a total of 21 statements of intent and agreements signed with foreign countries. Flourishing development of international technical trading in combination with China's opening up to the outside and policy of internal invigoration have made people understand that technology exports are an important part of China's foreign trade and will become one of the primary means of creating foreign exchange for the state. For this reason, technology exports are beginning to become an order of the day. This is something that is certain to develop quickly.

However, China's technology exports are in the creation stage at present and momentum is lacking. Moreover, this is extremely complex work that involves policy considerations in areas like security, law, commerce and so on, and it concerns national security, economic interests and a whole series of other questions, so we must strengthen administration. All regions and departments should be concerned with technology export work, have a positive attitude and liberate their ideas. We should take action to adopt measures of support and encouragement, and we should strengthen unified leadership and formulate the necessary systems of regulations to develop work in this area in an organized, planned, positive and stable manner to assure healthy progress in this line of work. Allow Chinese technology to go out into the world, gain glory for our nation and enrich human society!

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CSO: 4008/2085

## NATIONAL DEVELOPMENTS

### LI PENG OUTLINES COMPUTER DEVELOPMENT PLANS

HK300428 Beijing CHINA DAILY in English 30 Jun 86 p 1

[Article by our staff reporter Nie Lisheng]

[Text] Top priority has been given to the development and application of domestically-made computers as the nation steps up its efforts to modernize traditional industries, Vice-Premier Li Peng said yesterday at a national conference.

The machinebuilding industry is at the top of the list for computerization, to provide more electronically-controlled machinery for technical upgrading of such other important industries as energy, communications and building materials.

Li told a current national conference on computer application that the improvement of industrial machinery through electronics, especially microcomputers, would largely determine the process of modernization of all other sectors of the economy.

In the next five years, he said, the state would also build 11 national computerized information systems for such fields as telecommunications and weather forecasting. This will mark a new stage in China's computer application, involving comprehensive networks for the whole process of production or management rather than only for individual parts of the process.

Li also pointed to the urgent need to step up the training of computer personnel, especially computer scientists, manufacturers and operators. Official statistics show that China will need some 600,000 computer personnel by 1990, compared with 100,000 at present.

But Li emphasized that the wide introduction of computers should be based on the use of domestically-made products because of limited foreign exchange.

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CSO: 4010/1059

## NATIONAL DEVELOPMENTS

### YOUTH COMPUTER PROGRAM DESIGN CONTEST HELD

OW151944 Beijing XINHUA in English 1331 GMT 15 Jul 86

[Text] Beijing, 15 Jul (XINHUA)--Some 100 middle school students from various provinces, municipalities and autonomous regions across China attended the 1986 National Youngsters' Computer Program Design Contest which opened at Qinghua University today.

The contest covered basic computer knowledge, programming design language, programming techniques and computer operations.

Deng Xiaoping once called for more attention to spreading computer knowledge among children. Since 1984, China sponsors annuals national computer program design contests among youngsters, and this year's contest is sponsored by the Chinese Computer Federation.

An official from the Chinese Computer Federation said that the contest has promoted the spread of computer knowledge among youngsters, and aroused their interest in learning and using science. It also helps to train the younger generation for China's computer industry, he added.

Computer education for young people began in China in 1979. So far, more than 3,300 primary and middle schools in China have opened computer courses with a total attendance of 300,000 students. These schools, together with the scientific centers for youngsters at various places, are now equipped with 60,000 teaching minicomputers.

Meanwhile, three large-scale computer research centers for youngsters are not under construction in three Chinese cities--Hangzhou, Suzhou and Qingdao.

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CSO: 4010/1059

## NATIONAL DEVELOPMENTS

### NATION'S ELECTRONICS EXPORTS INCREASE IN FIRST HALF OF 1986

OW030916 Beijing XINHUA in English 0806 GMT 3 Aug 86

[Text] Beijing, August 3 (XINHUA)--China's electronics exports in the first half of this year jumped to 223 million U.S. dollars, 9.7 times over the same period of last year, according to an English journal.

The BEIJING REVIEW reports that the export electronics include color TV sets, tape recorders, radios, computers and peripheral equipment, radio equipment, loudspeakers and components.

Wang Enzhi, an official of the China National Electronics Import and Export Corporation, said that growing export of complete sets of electronic consumer goods, instead of parts and components as before, marks a striking change in the electronics trade.

He said China also began to sell abroad production lines and technology. Agreements and letters of intent have been signed with South Asian countries on export of production lines of black-and-white TV sets, electric fans, radios and technical transfers.

Chinese electronics products are selling to more than 30 countries and regions. Its radio-recorders and TV sets have been marketed in Europe, Japan and the United States.

Wang attributed the sharp increase to the expansion of China's electronics industry, which has been updated through import of technology and equipment.

He said some Chinese electronic products are competitive on the international market due to improved quality.

He expects China's electronics export to reach 400 million U.S. dollars [as received] by 1990.

The China National Electronics Import and Export Corporation, established in 1980, has branches in 17 provinces and municipalities in China and representative offices in Federal Germany, the United States and Hong Kong.

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## NATIONAL DEVELOPMENTS

### 'DETERMINED NOT TO BE LEFT OUT' IN ROBOT DEVELOPMENT

HK110207 Beijing CHINA DAILY in English 11 Jul 86 p 2

[Article by staff reporter Zhu Ling]

[Text] Despite the world's largest labor force, China is determined not to be left out in world development of mechanical workers.

The nation's first robot development centre will be built in Liaoning Province.

An earth-breaking ceremony for the centre was held in the city of Shenyang on Wednesday. The centre is expected to be completed in 1988.

An official of the Chinese Academy of Sciences told CHINA DAILY yesterday that the State-financed centre will cover 37,540 square metres, including factory buildings with numerically controlled equipment and computer-aided design systems, a robot performance laboratory and a pool.

The centre, costing 45 million yuan, will focus on developing robots of the second and third generations, he said.

The project is aimed at ushering in a new era in the country's efforts to catch up with the technological revolution in developed countries.

China is currently giving priority to the manufacture of industrial robots for paint-spraying, point and arc welding and cargo-carrying.

The nation expects to become a world leader in manufacture of simple, low-price robots to raise work efficiency and reduce labour intensity.

After that, the nation hopes to move into development of special-purpose robots, including movable robots to work in poisonous environments, handle accidents and inspect equipment, and remote-control robots for underwater and rescue operations, and coal mining.

Chinese scientists began research on robots in the early 1970s. Since then, more than 1,000 industrial mechanical arms and more than 100 industrial robots have been manufactured.



The country's first robot debuted in Guangzhou. The microcomputer-controlled robot can lift objects as heavy as 35 kilograms.

Doubts have been raised about development of robots in such a populated country. But many Chinese scientists argue that one robot does not necessarily mean the loss of one job.

If the country can raise productivity by using robots and accumulate more capital for industrial expansion, it will mean more jobs for more people, they say.

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CSO: 4010/1059

## NATIONAL DEVELOPMENTS

### ROBOT RESEARCH, DEVELOPMENT IMPORTANT FOR FUTURE

OW171739 Beijing XINHUA in English 1426 GMT 17 Jul 86

[Text] Shenyang, 17 Jul (XINHUA)--As China's economy develops, it will need increasing numbers of robots to do dangerous industrial work, the scientist who developed the country's first robot said today.

Jiang Xinsong, a director of the Shenyang Automation Institute of the Chinese Academy of Sciences, said more robots will also be needed as more prosperous Chinese workers become more selective about their jobs.

"And the country's one-child family policy in urban areas will have its effects as well," he told XINHUA.

"Millions of only children will enter the job market in the next decade," he explained, and despite increasing concern for safety in factories, "it's difficult to imagine that their parents will let their only children work in places where there is poisonous gas or strong radiation."

For these reasons, robot research has been classified a key science project for China's Seventh 5-Year Plan (1986-1990).

Construction has begun at the Shenyang Automation Institute of the country's first robot development center. It will cost 50 million yuan, Jiang said.

Chinese researchers are working on first generation robots--those that can be programmed and reprogrammed to perform simple tasks--to make them commercially viable on the domestic market. "That will be our work for the near future," said Jiang.

If it goes well, he predicted, China will be able to develop a full-fledged robot building industry by 1990.

But while working on basic robots, "there is also a need for China to develop the basic techniques for building more sophisticated ones," according to Jiang.

As far back as 1982, he said, the Shenyang Institute built a robot which could see and was practical for underwater observation as deep as 60 meters.

"This was a crude model of a second generation robot," he explained, "a robot with senses of touch and sight." The third generation has something resembling human intelligence, he said. "It can think, plan and make decisions in response to changed conditions."

To build more sophisticated robots as rapidly as possible, China has signed a 15-year contract to import technology from the United States for building a submersible robot that can be controlled across long distances.

"This will help China to meet current international standards for robots of this kind," Jiang said, adding that he will soon go to the United States to study the latest developments in robot technology.

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CSO: 4010/1059

## NATIONAL DEVELOPMENTS

### CAS SCIENTIFIC FUND APPLICATIONS REPORTED

Tianjin JISHU SHICHANG BAO in Chinese 4 Mar 86 p 1

[Article: "Good Results from the CAS Scientific Fund; Support Basic Scientific Research Work; Exploit China's Scientific Potential; Provide Experience for Implementation of a Scientific Fund System in China"]

[Text] The Chinese Academy of Sciences [CAS] Scientific Fund Commission has made practical explorations through preliminary trials of system reforms in basic research work over the past 4 years and obtained obvious results. It has provided experience for the implementation of a scientific fund system in China.

The CAS Scientific Fund Commission, a national and multidisciplinary natural science fund, was established in 1982 after receiving State Council approval. It has received a total of 9,344 applications over the past 4 years and the amount of requests exceeded 753 million yuan. It has approved 4,424 financial assistance programs worth a total of more than 172 million yuan. Intensive development of reforms in S&T systems has continued to increase the influence of the CAS Scientific Fund. The number of applications to the scientific fund in 1985 jumped to 4,531 with a total of 331.3 million yuan being requested, both amounts almost equal to the total over the previous 3 years.

The CAS Scientific Fund Commission has maintained strict adherence to CPC science and technology principles in assisting basic research work and exploiting scientific potential over the past 4 years. More than 30,000 personnel engaged in basic research have received financial assistance from the scientific fund and they have come to view the scientific fund as "timely rain" and "life-saving money." Under assistance by the scientific fund, 163 projects already have undergone expert appraisal or authentication. Some theoretical achievements have reached advanced world levels and received good evaluations and attention from Chinese and foreign colleagues.

The CAS trial of the scientific fund borrowed from the experiences of foreign countries and also proceeded from China's real situation for preliminary formation of a set of application, examination, allocation and administration methods for a scientific fund adapted to China's

national conditions. It has made definite contributions to alleviating the funding shortage for basic research, exploiting potential in Chinese science, promoting scientific research in institutions of higher education, the integration of education and scientific research and so on.

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CSO: 4008/2085

## NATIONAL DEVELOPMENTS

### PATENT APPLICATION METHOD FOR CHINESE ABROAD

Tianjin JISHU SHICHANG BAO in Chinese 4 Mar 86 p 1

[Article: "The Chinese Patent Bureau, Ministry of Foreign affairs and State Science and Technology Commission Jointly Announce 'Decision' Concerning Methods Proposed for Chinese Scholars To Apply for Patents for Inventions Completed While Abroad; Exploit China's Scientific Potential; Provide Experience for Implementation of a Scientific Fund System in China"]

[Text] To protect China's legitimate interests and prevent adverse effects on opportunities for Chinese visiting scholars, trainees, students and so on living abroad (referred to below as Chinese scholars) to apply for patents for inventions and innovations completed in foreign countries, the Chinese Patent Bureau, Ministry of Foreign Affairs and State Science and Technology Commission jointly announced their "Decision Concerning Patent Applications by Chinese Scholars for Inventions and Innovations Created While Abroad." It points out clearly the benefits of having the science and technology offices or other offices assigned to S&T work in Chinese diplomatic missions abroad (referred to below as embassy S&T offices) take responsibility for applications for patents for these inventions and innovations. The unit with ultimate authority in China is the Chinese Patent Bureau.

The "Decision" pointed out that if inventions and innovations completed by Chinese scholars while abroad clearly belong to the class of job-related inventions and innovations covered by the patent laws and other relevant stipulations of the host country, then after being checked by embassy S&T offices, the unit in which a Chinese scholar works while abroad may apply for the patent.

If they do not clearly conform to the conditions of job-related inventions and innovations, we should strive for Chinese patent application rights or for joint application rights. When necessary, embassy S&T office which, after considering its economic significance and other conditions, will permit it to be submitted directly in application for a foreign patent. Afterwards and depending on the situation, application for a patent may be made in China or in a third country. The foreign exchange needed to apply for the patent in principle should be provided by the applicant, but those who would have problems doing so may deal with it through links with

the department in China that sent them abroad or through the Patent Application Fund of the Chinese Patent Bureau.

The "Decision" also pointed out that patent rights obtained in foreign countries should have the question of their ownership dealt with on the basis of Chinese patent laws and in strict accordance with the relevant stipulations. Unless there are other agreements, Chinese patent application rights for inventions and innovations made by Chinese personnel while abroad as part of cooperative projects between China and a foreign country shall be the property of the unit inside China that assigned the Chinese counterparts. Applications for foreign patents for inventions and innovations made by units or individuals in China should be handled according to the stipulations of Chinese patent laws. Unapproved applications for foreign patents are not permitted.

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CSO: 4008/2085

## NATIONAL DEVELOPMENTS

### BRIEFS

CHEMICAL PRODUCT IMPROVEMENT--Chengdu, 4 Jun (XINHUA)--China's chemical products show steady improvement, according to a national meeting which closed here yesterday. An official at the meeting attributed the achievement to total strict inspection and quality control over the past few years. Phosphate fertilizer is up to the state standards. There is a general rise for soda ash, paint, boric acid, dyestuff and sulfuric acid. A sample survey by the chemical fertilizer monitoring center of the Ministry of Chemical Industry showed all urea produced by 14 large factories met first grade standards, as well as 90 percent produced by 36 medium-sized factories. Nitrogen fertilizer from small fertilizer plants also met top state standards. The state began to introduce a licensing system for production of phosphate fertilizer in 1984. The state issued licenses to 711 of the 909 applicants, bringing a halt to production of substandard fertilizer. [Text] [Beijing XINHUA in English 0144 GMT 4 Jun 86 OW] /6662

CHINESE-MADE CASSETTES--Nanjing, 28 Jun (XINHUA)--China has become self-sufficient in the production of tape cassettes, whereas until recently it had to make up the shortfall with imports, a national meeting on the subject in this capital of Jiangsu Province was told. More than 70 million cassettes were produced last year, covering 1,800 varieties--folk songs, Chinese and foreign music, operas, and lecture courses. Video recording discs are also being produced. Over the past 3 years, China established 72 recording units, in addition to 54 book publishing houses which also engage in tape recordings. [Text] [Beijing XINHUA in English 0704 GMT 28 Jun 86 OW] /6662

ARTIFICIAL HEART VALVE TESTER--Beijing, 1 Jul (XINHUA)--An artificial heart valve tester was appraised as reaching the world's advanced level by experts at a state technical appraisal meeting Sunday, the BEIJING DAILY reported today. The tester has succeeded in testing 63 types of artificial heart valves made at home and abroad since 1984, when it went into operation, according to the scientists. Listed as one of the state key scientific projects in the 1981-85 period, the tester was developed by scientists of Qinghua University in Beijing. [Text] [Beijing XINHUA in English 1227 GMT 1 Jul 86 OW] /6662

MICROCOMPUTER PRODUCTION--Beijing, 21 Jul (XINHUA)--Chinese-made microcomputers will account for about 80 percent of the total used in China by 1990, Electronic Industry Ministry officials have said. Altogether, 1.3 million



such computers are now in use in China, an additional 800,000 will be needed between 1986 and 1990, the officials said. The ministry has decided to streamline microcomputer production by organizing cooperation between different departments and localities. In the past two or three years, Chinese leaders have repeatedly called for work to promote the use of microcomputers as part of the effort to usher in a technical revolution. [Text] [Beijing XINHUA in English 0132 GMT 21 Jul 86 OW] /6662

ELECTRONICS CENTER FOR WESTERN PROVINCES--Beijing, 27 Jul (XINHUA)--China has decided to build a center of electronics industry in the western part of the country through promoting cooperation and retooling some military factories, PEOPLE'S DAILY reported today. Located in Sichuan, Shaanxi, Guizhou and Gansu provinces, its existing factories turned out electronic products worth 3.2 billion yuan (about 865 million U.S. dollars) and the value of the export products reached 58 million U.S. dollars last year. This made up a significant portion of China's electronics industrial output value. The decision was made at a meeting of the Ministry of Electronic Industry, which closed in Chengdu, capital of Sichuan Province on Saturday. Previously, the ministry decided to build an east center of electronics industry in Beijing, Shanghai and provinces of Jiangsu and Guangdong. [Text] [Beijing XINHUA in English 0538 GMT 27 Jul 86 OW] /6662

BEIJING APPLE COMPUTER WORKSHOP--Beijing, 2 Jun (XINHUA)--A computer workshop to teach Chinese students the Logo computer language opened here today, sponsored by China's State Education Commission with assistance from Apple Computer International Ltd. and computer experts. A team of six American computer experts, headed by Professor Donald Rasmussen, will spend a month teaching 40 Chinese primary and middle school teachers and educational researchers how to use the Logo computer language. The workshop will use 10 Apple II-E and two Macintosh computers given by the Apple Computer International Ltd. of America. Zhou Gucheng, vice-chairman of the Standing Committee of the National People's Congress, said at the opening ceremony that more and more computers will be used in China and computer study programs are now available in some Chinese primary and middle schools. He noted that the Logo computer language is very practical in teaching children how to use computers and he hoped that the workshop will promote China's computer education. According to the State Education Commission, China has some 180 million primary and middle school students. More attention will be paid to teaching children how to use computers at an early age. Both Mr Donald Rasmussen and Mr Larry David, managing director of the Apple Computer International Ltd., attended the opening ceremony and received gifts from the State Education Commission. [Text] [Beijing XINHUA in English 0934 GMT 2 Jun 86 OW] /6662

EUROPEAN FERTILIZER PRODUCTION CONTRACTS--Zhengzhou, 31 Jul (XINHUA)--The Zhongyuan Chemical Fertilizer Plant in Henan Province tonight signed contracts to import two European chemical fertilizer production lines, according to Henan Province officials. They said the state-owned plant will buy a 300,000-ton synthetic ammonia production line from the UHDE Company of the Federal Republic of Germany and a 520,000-ton production line to make urea, a nitrogen fertilizer, from the Snamprogetti Company of Italy. Both lines meet "advanced international standards," they said. According to the contracts, the lines will be completed in 1989 and use natural gas for fuel. The officials did not say how much they would cost. The plant is in Henan's Puyang County, in an area rich in oil and natural gas on the northern bank of the Yellow River. [Text] [Beijing XINHUA in English 1506 GMT 31 Jul 86] /8309

COMPUTER-AIDED DESIGN FOR SYNTHETIC GENES

Shanghai SHENGWUHUAXUE YU SHENGWUWULI XUEBAO [ACTA BIOCHIMICA ET BIOPHYSICA SINICA] in Chinese Vol 18, No 1, Jan 86 pp 18-26

[English abstract of article by Xia Zhiqing [1115 1807 3237], et al., of Shanghai Institute of Biochemistry, Academia Sinica]

[Text] Synthetic gene sequence have been designed with the aid of a computer, TRS-80. The strategy of design includes: a) make the best use of the optimal codons in host cells, b) form restriction sites in some special sequence regions for use in 'sectionalized cloning' and gene modification through changing synonymous codons and c) eliminate unnecessarily repeated or complementary sequences which may interfere with enzymatic ligation by proper fragmentation of the whole gene sequence. After considering all these factors, the sequence for a synthetic gene was finally obtained. (Paper received 11 Oct 84.)

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CSO: 4009/]085

## CHEMICAL SYNTHESIS OF NEW CYTOTOXIC PEPTIDE

Shanghai SHENGWUHUAXUE YU SHENGWUWULI XUEBAO [ACTA BIOCHIMICA ET BIOPHYSICA SINICA] in Chinese Vol 18, No 1, Jan 86 pp 60-73

[English abstract of article by Du Yucang [2629 7183 5547], et al., of Shanghai Institute of Biochemistry, Academia Sinica]

[Text] A new cytotoxic polypeptide with bacteria-inhibiting activity has been synthesized by the method of fragment condensation on solid support. The total coupling yield was over 60 percent. The amino acid sequence of this synthetic peptide is as follows: LKCNKLVPFLFYKTCGKGNLCYKMFVSNKMVPVKRGCIDVCPKSSLVLYK-VCCNTDRCN. This sequence is the same as that of MT-D<sub>1</sub>, a new cytotoxin from Chinese cobra snake venom, except for interchange of Leu and Val in positions 48 and 49. After HF treatment, gel filtration, oxidation and further purification on Sephadex G-50 and CMC column, the synthetic toxin showed the same biological and immunological activities as native MT-D<sub>1</sub>. (Paper received 18 Jan 85.)

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## CHEMICAL SYNTHESIS OF DYNORPHIN GENE FRAGMENT

Shanghai SHENGWUHUAXUE YU SHENGWUWULI XUEBAO [ACTA BIOCHIMICA ET BIOPHYSICA SINICA] in Chinese Vol 18, No 1, Jan 86 pp 80-89

[English abstract of article by Peng Bo [1756 3258], et al., of Shanghai Institute of Biochemistry, Academia Sinica]

[Text] The chemical synthesis of all fragments which constituted the dynorphin (1-13) gene was achieved. The 65 base pair synthetic gene sequence was designed in such a way that several dynorphin (1-13) structural genes may be ligated into a tandem gene with the Met codon ATC in between. It as expected that the multiple product of dynorphin (1-13)-homoserine might be obtained after expression of the tandem gene, followed by treatment with CNBr.

The coding sequence of the synthetic gene is preceeded by ATG and followed by TAA as well as TGA for start and stop translation signals, and terminated in an EcoRI and a BamHI recognition sequence. All 10 fragments of 10 to 17 nucleotides long were synthesized through the solid phase phosphoramidite method with silica gel as support. The tetrazole activated deoxyribonucleotide-3'-morpholino-methoxy-p hosphine was used to elongate stepwise the oligonucleotide chain and the yield of each cycle is over 85 percent or nearly quantitative. The synthesis could be performed manually and automatically. At the end of the synthesis the nucleotide chain was removed from the support and deprotected, then purified with polyacrylamide gel electrophoresis. The purity of the synthetic fragments was confirmed by gel electrophoresis after 5'-labelling and by sequence analysis. (Paper received 13 Feb 85.)

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HOMOGENOUS SEQUENCE IN THE ANTICODON OF NATURAL UAG SUPPRESSOR tRNA<sup>Tyr</sup>

Shanghai SHENGWUHUAXUE YU SHENGWUWULI XUEBAO [ACTA BIOCHIMICA ET BIOPHYSICA SINICA] in Chinese Vol 18, No 1, Jan 86 pp 90-95

[English abstract of article by Feng Yaxiong [7458 0068 7160], et al., of Department of Bioscience and Technology, Shanghai Jiao Tong University]

[Text] A natural UAG suppressor tRNA<sup>Tyr</sup> from the posterior silk gland of *Antheraea pernyi*, which can promote readthrough over the UAG termination codon, has been purified and sequenced. The corresponding codon-anticodon interaction is not in accord with the wobble hypothesis. The nucleotide sequence in the anticodon loop is homogenous for all other natural UAG suppressor tRNA<sup>Tyr</sup>. It may imply that the anticodon loop plays a key role for these suppressor tRNA's to readthrough over the UAG termination codon. (Paper received 5 Apr 85.)

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## MICROENVIRONMENT OF TRYPTOPHAN RESIDUES OF ALDOLASES

Shanghai SHENGWUHUAXUE YU SHENGWUWULI XUEBAO [ACTA BIOCHIMICA ET BIOPHYSICA SINICA] in Chinese Vol 18, No 1, Jan 86 pp 102-108

[English abstract of article by Xu Genjun [6079 2704 0193], et al., of Shanghai Institute of Biochemistry, Academia Sinica]

[Text] Aldolase can be modified specifically on the phosphate binding site with pyridoxal phosphate. The absorption maximum of the pyridoxamine phosphate derivative of aldolase was at 325nm. It overlaps with the fluorescence emission band of tryptophan. When the tryptophans on the enzyme are the fluorescence donor groups and pyridoxamine phosphate is the acceptor group, the distance between tryptophan and the lysyl residue at the catalytic site was estimated to be about 14 Å for both snake muscle and rabbit muscle aldolases, when using the singlet-singlet energy transfer evaluation.

The quantum yields of tryptophan in aldolase were less than 0.05, lower than those in most known enzymes and proteins, suggesting prominent quenching produced by the microenvironment around tryptophan residues.

The fluorescence of snake muscle aldolase was about 1/6 quenched by acrylamide. Under the same conditions the fluorescence of rabbit muscle aldolase was not quenched. The conformations around the tryptophan residues are probably different for the two enzymes. Taking the same value for quantum yield for the estimation, 2 tryptophan residues could account for the process of fluorescence quenching. These results support our previous finding that the four subunits in the molecule of snake muscle aldolase are asymmetrical. (Paper received 11 May 85.)

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SUPPRESSION OF HUMAN NATURAL KILLER (NK) CELL ACTIVITY BY DIFFERENTIATED MATURE MACROPHAGES IN VITRO

Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese Vol 19, No 2, Jun 86 pp 211-225

[English abstract of article by Zhang Zongliang [1728 1350 2733], et al., of Shanghai Institute of Cell Biology Academia Sinica]

[Text] We have developed previously a procedure to detect the down- and up-regulation of NK cell activity by in vitro differentiated mature human macrophages (M $\phi$ ) and LPS modulated M $\phi$ . The aim of this study is to investigate the dynamic changes of monocyte-M $\phi$  in the course of in vitro culture with respect to their regulation of NK cell activity and its possible mechanism.

Human mononuclear cells (PBMNC) of healthy adult donors were separated by plastic adherence as previously described and cultured first in RPMI-1640 medium supplemented with 20% AM serum for 0,2,4,6 and 8 days separately. Their effect on NK cell activity was then tested by mixing them with freshly isolated PBMNC and <sup>51</sup>Cr-labeled K 562 tumor cells and measuring <sup>51</sup>Cr release in a 4 hr short-term assay. The results showed that with the increase of cell size (Table 1), day 6 and day 8 macrophages in culture were reproducibly shown to have the property to down-regulate NK cell activity (more than 50 percent suppression) as compared with day 0, 2 and 4 M $\phi$ s at a ratio of M $\phi$  to PBMNC of 0.5:1 (Table 2). This finding indicated that human blood monocyte-M $\phi$  at different stages of differentiation/maturation may have a distinct function and that down-regulation of NK activity by day 6 and day 8 M $\phi$ s can be measured by a rapid and efficient 4 hr short-term assay. The suppression of NK cell activity against K562 cells by cultured M $\phi$ s was correlated with their level of cytostasis toward P388 tumor cells (Table 3).

E-type prostaglandin (PGE) and oxygen radical productions (O<sub>2</sub><sup>-</sup>, H<sub>2</sub>O<sub>2</sub>, OH<sup>•</sup>) have been shown to be able to impair NK activity, but in the present experiment, the presence of indomethacin (1 $\times$ 10<sup>-5</sup>M), an inhibitor of PGE synthetase, and catalase (4000 units/ml), a H<sub>2</sub>O<sub>2</sub> oxidoreductase, has not caused any lowering of the observably impaired NK activity. This might mean that the observed suppression of NK activity is not due to prostaglandins and/or free oxygen radicals (Table 4). Furthermore, the failure to see any appreciable killing of <sup>51</sup>Cr-labeled day 6 M $\phi$  by allogenic NK cells from normal individuals (Table 5) tends to rule out the possibility that the suppression of M $\phi$  against NK cell activity is HLA-restricted and that M $\phi$ s bear target structures which can be recognized by NK cells and competed with those of K562 tumor cells.

Adherent monocyte-M $\phi$  from day 0 and day 6 were sonicated by Fisher Sonic Dismembrator Model 150.95-98 percent of viable M $\phi$ s was destroyed and suppression activity of sonicates was then measured. No lowering, but even an increase, of suppression of NK activity by day 6 M $\phi$  sonicates was seen (Table 6). Similarly, day 6 M $\phi$  sonicates also shown a strong cytostasis effect on P388 tumor cells (Table 7). These results indicated that differentiated mature human M $\phi$ s may produce and release soluble mediator(s) to exert their action on NK activity and tumor cell cytostasis.



**Table 1. Size of human monocyte-macrophage cells at different stages of differentiation**

Days in culture	0	2	4	6	8
Cell diameter( $\mu$ m)	17.8 $\pm$ 1.9*	21.6 $\pm$ 2.2	26.5 $\pm$ 3.0	31.1 $\pm$ 4.0	33.3 $\pm$ 4.1

\* Data (Mean $\pm$ S.D.) in each group by counting 100 latex bead positive cells

**Table 2. Dynamic change of suppression of NK activity by human monocyte-macrophage at differentiation stages**

Days in culture		% NK activity				
		0:1	Monocyte-macrophages : PBMNC (5 $\times$ 10 <sup>5</sup> )			
			0.125:1	0.25:1	0.5:1	1:1
0	(n=7)*	45.2 $\pm$ 9.6	46.9 $\pm$ 9.8 (-3.8)**	46.7 $\pm$ 7.3 (-3.3)	47.6 $\pm$ 8.1 (-5.3)	50.8 $\pm$ 10.8 (-12.4)
2	(n=7)	43.7 $\pm$ 9.9	42.6 $\pm$ 15.1 (2.5)	42.1 $\pm$ 16.7 (3.7)	41.1 $\pm$ 16.2 (5.9)	34.3 $\pm$ 15.9 (21.5)
4	(n=5)	40.7 $\pm$ 4.0	37.7 $\pm$ 5.3 (7.4)	33.7 $\pm$ 2.4 (17.2)	30.5 $\pm$ 2.3 (25.1)	18.2 $\pm$ 4.8 (55.3)
6	(n=7)	46.8 $\pm$ 8.5	42.7 $\pm$ 8.6 (8.8)	33.4 $\pm$ 7.9 (28.6)	22.1 $\pm$ 6.9 (52.8)	N.D.
8	(n=3)	54.0 $\pm$ 2.1	47.6 $\pm$ 9.2 (11.9)	40.0 $\pm$ 6.9 (25.9)	22.7 $\pm$ 4.8 (58.0)	N.D.

\* n=number of experiments.

\*\* % inhibition of NK activity.

The possibility of space barrier or artificial crowding effect induced by M $\phi$ s can also be ruled out by the fact that modulated day 6 M $\phi$  by LPS actually enhanced the expression of NK activity (Table 8), because modulated and non-modulated day 6 M $\phi$ s are of same size. The above data again point out to the possible release of enhancing factor(s) by modulated M $\phi$ s and suppressing factor(s) by non-modulated ones. It may be questioned whether all of the impaired NK activity by mature M $\phi$ s in vitro can be mainly attributed to the release of soluble factors, but this appears to be highly possible from the evidences at our own hands.

**Table 3. Dynamic change of cytostatic action of human monocyte-macrophages during in vitro differentiation stages against P 388 tumor cells**

Days in culture		Monocyte-macrophages : P 388 cells (2 $\times$ 10 <sup>4</sup> )		
		12	6	3
0	(n=8)*	66.1 $\pm$ 13.5**	43.5 $\pm$ 13.2	27.8 $\pm$ 12.3
2	(n=7)	88.6 $\pm$ 6.9	61.8 $\pm$ 20.3	43.0 $\pm$ 18.6
4	(n=5)	96.2 $\pm$ 3.6	79.6 $\pm$ 13.7	56.3 $\pm$ 11.1
6	(n=10)	98.4 $\pm$ 1.7	97.7 $\pm$ 3.5	87.4 $\pm$ 12.2
8	(n=6)	98.6 $\pm$ 1.6	98.2 $\pm$ 1.4	92.8 $\pm$ 5.5

\* n=number of experiments.

\*\* % inhibition of DNA synthesis of P 388 tumor cells.

Table 4. Effect of catalase and indomethacin on day 6 M $\phi$ -mediated inhibition of NK cell activity

Agents	% NK activity			
	M $\phi$ : PBMNC ( $5 \times 10^5$ )			
	0:1	0.125:1	0.25:1	0.5:1
Medium	42.6 $\pm$ 9.8* (34.1-53.3)**	34.4 $\pm$ 12.0 (26.3-48.2)	29.7 $\pm$ 7.4 (24.0-38.0)	26.8 $\pm$ 6.8 (21.0-33.7)
Catalase (4000 $\mu$ /ml)	41.3 $\pm$ 7.3 (33.8-48.3)	33.3 $\pm$ 4.8 (29.3-38.6)	26.9 $\pm$ 1.4 (25.9-28.5)	21.4 $\pm$ 3.1 (18.8-24.9)
Indom ( $1 \times 10^{-5}$ M)	42.8 $\pm$ 9.2 (33.1-51.5)	30.8 $\pm$ 1.9 (28.7-32.3)	29.4 $\pm$ 1.7 (27.4-30.6)	23.2 $\pm$ 1.0 (22.0-23.8)
Catalase + Indom	35.7 $\pm$ 9.3 (26.7-45.3)	28.8 $\pm$ 7.3 (22.8-36.9)	23.0 $\pm$ 3.1 (19.5-25.4)	18.7 $\pm$ 0.8 (17.9-19.5)
P value	P>0.05	P>0.05	P>0.05	P>0.05

\* Different experiments Mean $\pm$ S.D.

\*\* Range of % NK activity.

P values were calculated for each experimental group against medium control group.

Table 5. Target cell susceptibility test of NK cells from PBMNC (4 hr  $^{51}$ Cr release assay)

Exp.	$^{51}$ Cr labeled target cells	% NK activity		
		PBMNC : Target ( $1 \times 10^4$ )		
		100	50	25
1	Macrophage-1*	- 2.5 $\pm$ 0.1	- 6.4 $\pm$ 0.6	3.6 $\pm$ 0.1
	Macrophage-2	3.1 $\pm$ 0.3	0.7 $\pm$ 0.1	2.8 $\pm$ 0.1
	K 562	32.6 $\pm$ 1.4	37.8 $\pm$ 3.2	28.6 $\pm$ 0.7
2	Macrophage-3	- 13.3 $\pm$ 2.3	- 10.3 $\pm$ 0.3	- 9.1 $\pm$ 1.3
	K 562	55.8 $\pm$ 2.5	61.5 $\pm$ 5.3	52.7 $\pm$ 2.1
8	Macrophage-4	- 0.9 $\pm$ 0.1	3.1 $\pm$ 0.1	3.0 $\pm$ 0.1
	K 562	44.5 $\pm$ 1.4	48.4 $\pm$ 0.6	37.6 $\pm$ 1.4

\* 6 day macrophages in culture, macrophages and PBMNCs are allogenic.

In sum, the results from this paper and from our previous works indicated that the regulatory function of M $\phi$ s on NK cell activity is correlated to their state of differentiation and the positive and negative regulation of NK activity can be attributed to different M $\phi$  subpopulations.

**Table 6. Suppression of NK activity by sonicated human monocyte-macrophages in culture**

Exp.	Days of monocyte-macrophages in culture	Sonication**	%NK activity		
			Monocyte-macrophages : PBMNC ( $5 \times 10^5$ )		
			0.5:1	0.25:1	0:1
1	Day 0	Yes	$54.7 \pm 5.0$ (-1.8)*	$60.5 \pm 4.2$ (-10.6)	
		No	$50.3 \pm 2.2$ (-3.1)	$50.9 \pm 4.6$ (5.2)	
					$53.7 \pm 9.5$
	Day 6	Yes	$31.9 \pm 3.4$ (40.6)	$38.1 \pm 4.2$ (29.1)	
		No	$37.2 \pm 1.7$ (30.7)	$60.5 \pm 4.0$ (-12.7)	
2	Day 0	Yes	$47.7 \pm 1.4$ (-10.4)	$52.8 \pm 8.6$ (-22.2)	
		No	$40.3 \pm 1.0$ (6.7)	$41.8 \pm 4.2$ (3.2)	
					$43.2 \pm 8.3$
	Day 6	Yes	$31.9 \pm 1.7$ (26.1)	$38.2 \pm 3.2$ (11.5)	
		No	$33.9 \pm 2.5$ (21.6)	$45.5 \pm 2.7$ (-5.3)	

\* Percentage suppression is shown in parentheses.

\*\* Adherent cells and M $\phi$  were sonicated by Fisher Sonic Dismembrator Model 150, three pulses of 30 sec for each.

**Table 7. Cytostasis of P 388 tumor cells by sonicated human monocyte-macrophages in culture**

Exp.	Days of monocyte-macrophages in culture	Sonication	% inhibition of DNA synthesis on P 388 cells		
			Effect : Tumor ( $2 \times 10^4$ )		
			25	12	6
1	Day 0	Yes	$938 \pm 62^*$ (92.5)**	$3113 \pm 163$ (75.2)	$6974 \pm 234$ (44.5)
		No	$2689 \pm 158$ (78.6)	$5483 \pm 172$ (56.4)	$7473 \pm 17$ (40.6)
	Day 6	Yes	$49 \pm 43$ (99.6)	$191 \pm 54$ (98.5)	$214 \pm 8$ (98.3)
		No	$64 \pm 67$ (99.5)	$53 \pm 25$ (99.6)	$674 \pm 34$ (94.5)
	Day 0	Yes	$3029 \pm 149$ (75.9)	$6312 \pm 172$ (49.8)	$8818 \pm 36$ (29.4)
		No	$3434 \pm 190$ (72.7)	$6097 \pm 927$ (51.5)	$7284 \pm 39$ (42.1)
2	Day 6	Yes	$97 \pm 20$ (99.2)	$255 \pm 38$ (97.9)	$375 \pm 40$ (96.9)
		No	$44 \pm 54$ (99.6)	$76 \pm 70$ (99.4)	$1123 \pm 17$ (90.9)

\* CPM value, Exp1. P 388 CPM :  $12576 \pm 516$ ; Exp 2. P 388 CPM :  $12349 \pm 480$ .

\*\* Percentage inhibition is shown in parentheses.

Table 8. Up-regulation of modulated human macrophages on NK killing of K 562 tumor cells (4 hr  $^{51}\text{Cr}$  release assay)

Cultured day 6 macrophage treatment	% NK activity							
	Mφ plus PBMNC ( $5 \times 10^5$ )*				Mφ alone			
	Macrophage							
	$1 \times 10^6$	$0.5 \times 10^6$	$0.25 \times 10^6$	$0.125 \times 10^6$	$1 \times 10^6$	$0.5 \times 10^6$	$0.25 \times 10^6$	$0.125 \times 10^6$
+	$19.6 \pm 1.7$ (53.4)**	$61.8 \pm 1.7$ (-46.8)	$69.9 \pm 8.2$ (-66.0)	$66.1 \pm 7.1$ (-57.0)	$3.2 \pm 0.5$	$10.0 \pm 0.6$	$8.6 \pm 0.4$	$5.6 \pm 0.5$
-	$14.6 \pm 4.0$ (65.3)	$27.0 \pm 2.0$ (35.9)	$34.8 \pm 0.6$ (17.3)	$39.9 \pm 2.3$ (5.2)	$2.2 \pm 0.1$	$4.6 \pm 0.4$	$3.5 \pm 0.4$	$1.3 \pm 0.2$

\*  $1.5 \times 10^5$  PBMNC % NK activity:  $42.1 \pm 2.1$ .

2. Treatment of macrophages by LPS ( $10 \mu\text{g/ml}$ ) for 18 hrs, then washing away LPS.

Preincubation with PBMNC for 4 hr, measured  $^{51}\text{Cr}$  CPM in supernatate.

3. The experiment was repeated four times and the results of a representative experiment are given here.

\*\* % inhibition of NK activity is shown in parentheses.

(Paper received 6 Dec 85, finalized 3 Jan 86.)

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CSO: 4009/1086

ROLE OF B CELLS IN CFU-MIX GROWTH

Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese  
Vol 19, No 2, Jun 86 pp 203-210

[English abstract of article\*by Jiang Feizi [3068 7378 1311], et al., of Institute of Basic Medical Sciences, Academy of Military Medical Sciences, Beijing]

[Text] Role of B cells in growth of multipotential progenitor cells was extensively studied when we had reported the augmentative effects of B cells on proliferation of CFU-S and CFU-GM, and the stimulating activity in the conditioned medium of B cells. B cells were successfully isolated from the mouse spleen by means of free-flow electrophoresis (Elphor Vap-11) as usual. The isolated B cells samples (IBC) containing  $93.5 \pm 1.1\%$  of Anti-IgM. G. A-FITC positive cells and 0% of Anti-Thy 1.2-FITC positive cells. Colonies derived from CFU-mix increased to  $20.7 \pm 2.8$  in the co-culture of BMC and IBC as compared with the number of CFU-mix colonies  $4.4 \pm 0.3$  and  $2.1 \pm 0.2$  respectively in the separate cultures of BMC or IBC alone with the same amount as in co-cultivation. Number of p-BFU-E colonies in co-culture of IBC and BMC was extremely higher than that in the control.

Colonies of CFU-mix markedly increased in the presence of conditioned medium of a transformed B cell line (M 12.4.1-CM) 3.9 times as many as that in the control whereas no colony at all could form in the culture added with M12.4.1-CM only but without addition of any conventional CSF-mix. This result was consistent with the suggestion that in the M 12.4.1-CM there was just activity of co-CSF-mix but not CSF-mix.

It was shown by cytopspin for single mix-colony analysis that numbers of CFU-GEMm and p-BFU-E were enhanced significantly up to 25.0 and 55.0 percent respectively in the cultures with M12.4.1-CM whilst just 6.7 and 37.8 percent in the control without M 12.4.1-CM.

A notable result happened when IBC were cocultured along with 1000-rad-irradiated BMC that CFU-mix emerged up to  $19.3 \pm 1.0$  per dish while CFU-mix colonies could just be enumerated as  $2.1 \pm 0.2$  and  $0 \pm 0$  per dish respectively in culture of IBC or 1000-rad-irradiated BMC separately in the conventional culture system.

Our data showed the influence of different activities in culture on various types of colonies which formed in the culture of IBC alone, e.g. with ML-CM more CFU-GEMm and CFU-GMm emerged, however, more p-BFU-E formed when adding ML-CM along with Lung-CM.

Colonies derived from CFU-mix was reducing when various dilutions of anti-IgM serum and complement were added in the culture of IBC. A linear correlation was shown between the number of CFU-mix in culture counted and the amount of anti-IgM serum added.

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\* (Projects Supported by the Science Fund of the Chinese Academy of Sciences)

What remains obscure is the possibility of rejuvenation of a small part of B cells to multipotential progenitor cells under certain microenvironment. It is to be clarified if minority of B cells are the candidates of hemopoietic progenitor cells or B cells and CFU-mix have the same property of surface electron to mix up during free-flow electrophoresis.

(Paper received 18 Oct 85, finalized 3 Jan 86.)

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ISOLATION AND CHARACTERIZATION OF OUABAIN RESISTANT MUTANTS OF CHINESE HAMSTER CELL (Wg3-h)

Shanghai SHIYAN SHENGWU XUEBAO [ACTA BIOLOGIAE EXPERIMENTALIS SINICA] in Chinese Vol 19, No 2, Jun 86 pp 162-167

[English abstract of article by Qi Ming [4359 7686], et al., of Institute of Genetics, Fudan University]

[Text] Sixteen mutants resistant to ouabain, which inhibits the plasma membrane  $\text{Na}^+ + \text{K}^+$  ATPase, have been isolated from Wg3-h. Ouabain at concentrations of 0.5 mM with 3.0 mM  $\text{K}^+$ , or 0.025 mM with 0.3 mM  $\text{K}^+$ , inhibits the growth of the wildtype cells and is ultimately cytotoxic. Clones 10-fold more resistant than wild-type in terms of dose were obtained by single-step selection from a wild-type population in the presence of ouabain. The phenotypes of ouabain-resistant (OuaR) clones are reproducible with high fidelity and stable over one-year interval of growth in the absence of the selecting compound. Wild-type and OuaR Wg3-h cell clones were compared with respect to their susceptibility to ouabain inhibition of  $\text{K}^+$  uptake by whole cells. OuaR cells are less sensitive to ouabain inhibition on active  $\text{Na}^+$ ,  $\text{K}^+$  transport than are wild type cells of the original cell line. There are no significant differences in growth rate and requirement of growth conditions between the OuaR cells and the OuaS cells.

The morphological features were observed by scanning electronic microscopy. The nature of OuaR is [discussed with the result of 2 D-gel electrophoresis.

The OuaR marker can be useful for selection of somatic cell hybrids.

(Paper received 20 May 85, finalized 26 Sep 85.)

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CSO: 4009/1086

## SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

### SCIENCE FOUNDATION ESTABLISHES TIES WITH U.S.

OW161423 Beijing XINHUA in English 1337 GMT 16 Jul 86

[Text] Beijing, 16 Jul (XINHUA)--The National Natural Science Foundation of China (NSFC) has established ties with the U.S. National Science Foundation with an aim of promoting cooperation with its international counterparts, NSFC announced here today.

NSFC secretary-general Wang Jian told XINHUA that this year, NSFC will send its people to visit science foundation organizations in Europe and America.

"Cooperation and academic exchanges with other countries will benefit NSFC in terms of decision-making and management as well as China's basic research work and personnel training," he said.

NSFC chairman Tang Aoqing will invite both foreign and Chinese scholars, specialists and industrialists to form a NSFC advisory committee with a planned membership of 50, he added.

Scientists involved in projects financed by NSFC may apply for cooperation with their foreign colleagues and for participation in international academic seminars.

"As a government department, NSFC gets its fund mainly from the state, but it also accepts donations by both Chinese and international individuals and organizations," the NSFC official said, adding that the use of donations may be oriented by the donors.

So far, NSFC has received nearly 12,000 applications from across the country, and grants are expected to be decided by the end of this year, the official added.

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CSO: 4010/1060

## SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

### CAS COOPERATES WITH BEIJING, QINGHUA UNIVERSITIES

OWO41756 Beijing XINHUA in English 1424 GMT 4 Jul 86

[Text] Beijing, 4 Jul (XINHUA)--The Chinese Academy of Sciences [CAS], Beijing University and Qinghua University has jointly decided to build three open labs for biomembrance and membrane engineering, structural chemistry, and micro-fabrication and micro-structure in Beijing within the year for developing the country's high-tech industries.

The decision was announced here today by CAS Vice-President Zhou Guangzhao, Vice-President Chen Jia'er of Beijing University and Vice-President Zhang Xiaowen of Qinghua University.

Scientists and professors from the three units attended a seminar here today to exchange views on how to closely cooperate in scientific research, and strengthen basic and applied research.

Ma Dayou, a research fellow of CAS's Institute of Acoustics, said that cooperation between research institutes and universities would help avoid repetition of low-level basic research and waste of human and financial resources. Cooperation makes it possible to concentrate equipment and outstanding scientists on high-level research, enabling scientific research in some aspects to reach the international level.

Wang Yiqiu, Dean of Studies at Beijing University, expressed the view that the integration of teaching, scientific research and production is key to developing China's science and technology. Universities and research institutes can join hands in training post-graduates. Scientists can give lectures at universities and university teachers can do research at research institutes.

Seminar participants considered that cooperation between research institutes and universities is an important part of the country's current reforms of scientific research and education management systems, and a major means for training promising young scientists.

During 1986, CAS, Beijing University and Qinghua University will jointly enroll post-graduates in some specialities, encourage researchers and teachers to do joint research and undertake major scientific research projects assigned by the state or apply for the science fund for high-tech development projects. The three sides also agreed to jointly sponsor national or international academic symposiums.

## SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

### BRIEFS

HEILONGJIANG URBAN SCIENTIFIC ASSOCIATION--The Heilongjiang Provincial Urban Scientific Research Association was established in Harbin City on 12 July. Hou Jie was elected director of the association; nine persons, including (Wu Jingtai), were elected deputy directors of the association; and (Zhong Guangyin) was elected secretary general. In order to meet the demands of the province's economic, social, scientific and technological development, the association is assigned the task of organizing and encouraging specialists, scholars, and practical workers in all fields to undertake overall research on the urban areas, to solve theoretical and practical problems, and to make contributions to building a socialist urban scientific structure with Chinese characteristics. [Text] [Harbin Heilongjiang Provincial Service in Mandarin 2100 GMT 12 Jul 86 SK] /9738

CSO: 4008/1106

## AERODYNAMICS

### A NEW TECHNIQUE OF NUMERICAL CONFORMAL MAPPING AND ITS APPLICATIONS

Mianyang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4, No 2, Jun 86 pp 150-158

[English abstract of article by Huang Mingke [7806 2494 1870] of the Nanjing Aeronautical Institute]

[Text] A systematic method of numerical conformal mapping is developed in this paper to map the exterior of an arbitrary 2-D body having several discontinuities of surface slope onto the exterior of a unit circle. The use of the FFT technique makes the execution of the computation very fast. The method developed can be applied to the computation of incompressible flow past an arbitrary 2-D body, to that of the apparent mass coefficients of the cross-sections, and to the generation of the orthogonal, conformal grid used in finite difference method. Several examples presented show that the present method has an order faster in computation of the grid generation than that of the usual Thompson's method, and that the grid generated has the orthogonality everywhere. The another superiority is that, for many problems, the governing equation usually takes the especially simple form on the mapping plane.

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CSO: 4009/105

NUMERICAL SOLUTION OF TRANSONIC SMALL DISTURBANCE PRESSURE EQUATION USING A MIXED DIFFERENCE METHOD

Mianyang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4, No 2, Jun 86 pp 159-167

[English abstract of article by Wang Lixia [3769 0448 7209] and Luo Shijun [5012 2514 6874] of Northwestern Polytechnical University]

[Text] A transonic small disturbance pressure equation (i.e. TSDP equation)

$$\left(1 - M_{\infty}^2 - \frac{\gamma+1}{V_{\infty}} M_{\infty}^2 u\right) u_{xx} + u_{yy} - \frac{\gamma+1}{V_{\infty}} M_{\infty}^2 u_x^2 = 0$$

is proposed for computing transonic flow fields in wind tunnel or free streams.

The mixed difference method is used to calculating TSDP equation. Numerical experimentation indicates that the use of suitable difference schemes and relaxation technique yields converged solutions to TSDP equation. Comparisons show that TSDP solutions agree well with those of transonic small disturbance potential equation. Application of the procedure to assessing transonic wind tunnel interference and designing airfoil from the given pressure distributions are illustrated.

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CSO: 4009/105

INCOMPRESSIBLE THEORY OF THE INTERACTION BETWEEN MOVING BODIES AND VORTICITY  
FIELD--THE GENERATION OF VORTICITY BY BODY SURFACES AND ITS DISSIPATION

Mianyang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4,  
No 2, Jun 86 pp 168-176

[English abstract of article by Wu Jiezhi [0702 0094 0037] of the Chinese  
Aeronautical Establishment]

[Text] The interaction between moving bodies and fluids, a classical problem of fluid dynamics, is reexamined from the viewpoint of vorticity dynamics. In this way, we may gain some new insight into the mechanism of the interaction and can be led to a series of results which are of practical value. The present paper studies the action of a moving surface to vorticity field and gives a general incompressible theory of the generation of vorticity at the surface and its dissipation in the fluid. It is found that there are two types of vorticity sources, the global one depends only on the acceleration property of the surface geometry, while the local one exists in both accelerated and uniform motion, consisting of tangential sources from pressure gradient and a three-dimensional effect of the surface curvature, and a normal source due to the divergence of the two-dimensional vorticity on the surface.

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CSO: 4009/105

A STRONG INVISCID-VISCOUS INTERACTION SOLUTION OF A PLANE TRANSONIC CASCADE FLOW

Mianyang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4, No 2, Jun 86 pp 177-183

[English abstract of article by Chen Yunwen [7115 0336 2429], et al., of Qinghua University]

[Text] An inviscid-viscous interaction method has been developed to predict the blade-to-blade flow in plane turbine cascades. The interaction effect is taken into account by iteratively solving the inviscid and viscous flows. The inviscid flow is calculated by a finite area time-marching method. The viscous flow is calculated by the integral method: Loitsianskii's method for laminar boundary layer after performing Illingworth-Stewartson transformation and Green's lag-entrainment method for turbulent boundary layer and wake. A mixing calculation is carried out to determine the kinetic energy loss coefficient. The exit angle is determined by the base line of the wake predictions agree well with the test results for two transonic turbine cascades.

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CSO: 4009/105



# NUMERICAL CALCULATIONS OF INVISCID TRANSONIC FLOWS OVER WINGS

Mianyang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4,  
No 2, Jun 86 pp 184-192

[English abstract of article by Chen Zuobin [7115 0155 2430], et al., of the  
China Aerodynamic Research and Development Center]

[Text] A numerical method for calculating steady inviscid transonic flows over wings is introduced in this paper. The fully potential equation is chosen as the mathematical model. The infinite physical domain is transformed to the finite computing domain and the swept wing is transformed to the rectangle wing, using proper mathematical transformation. The equation is discretized in computing domain using mixed finite scheme and the line relaxation method is used for solving the resulting nonlinear algebraic equation. Successively refining mesh makes the calculation very economic.

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CSO: 4009/105

COMPUTATIONAL SIMULATION OF TRANSIENT WAVE MOTIONS INDUCED BY A SUBMERGED BODY

Mianyang KONGQIDONGLIXUE XUEBAO [ACTA AERODYNAMICA SINICA] in Chinese Vol 4,  
No 2, Jun 86 pp 212-217

[English abstract of article by Chen Yaosong [7115 5069 2646], et al., of  
Beijing University]

[Text] In this article a new method is given to treat transient wave motion. In advantage of the huge capacity of the modern computer, the simple doublet is taken as fundamental singular solution and more unknown points are set on the water surface. The computational process is very simple. However, the complex nature of the motion can be simulated. The sudden start of a submerged cylinder is taken as an example, and whole process of the wave formation behind the cylinder has been exposed very well.

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CSO: 4009/105

## INFRARED RESEARCH

### A SUB-MM AND MM WAVEGUIDE MADE OF GOLD-COATED GLASS TUBE

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese  
Vol 5, No 3, Jun 86 pp 161-166

[English abstract of article by Xiong Shouren [3574 1343 0088], et al., of  
the Shanghai Institute of Technical Physics, Academia Sinica]

[Text] Attenuation constants of metals and glass hollow cylindrical waveguides for optically pumped far infrared waveguide lasers are calculated by using existing theories. A new way to build a metal hollow cylindrical waveguide for sub-mm and mm waves is given by coating gold on the inner-wall of the glass tube. The far infrared transmission characteristics of this waveguide are investigated at wavelengths of 118.8 $\mu$ m, 447.2 $\mu$ m and 496 $\mu$ m. The performance of this waveguide is better than that of a brass one.

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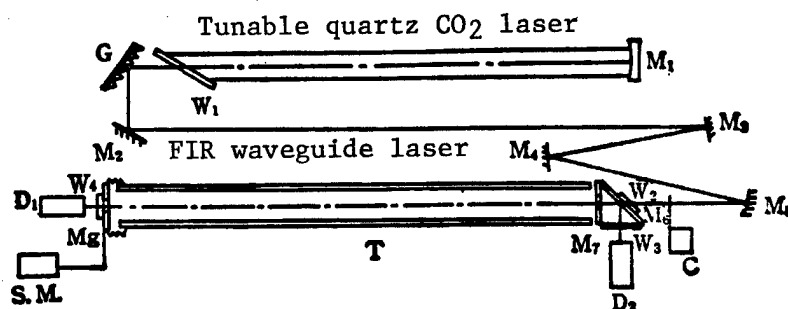
CSO: 4009/103

# A CW OPTICALLY PUMPED FIR WAVEGUIDE LASER WITH GOLD-COATED GLASS TUBE

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese  
Vol 5, No 3, Jun 86 pp 167-174

[English abstract of article by Su Jinwen [5685 6930 2429], et al., of the  
Shanghai Institute of Technical Physics, Academia Sinica]

[Text] A CW optically pumped gold-coated glass waveguide FIR laser with higher FIR gain and absorption efficiency developed by special technique is reported. Its characteristics are investigated. FIR lines in the wavelength range from  $70.6\mu\text{m}$  to  $1.25\text{mm}$  using  $\text{CH}_3\text{OH}$ ,  $\text{HCOOH}$ ,  $\text{CH}_3\text{I}$  and  $\text{CD}_3\text{I}$  as working materials are obtained.



The experimental setup of the optically pumped FIR waveguide laser with gold-coated glass tube

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CSO: 4009/103

A STUDY ON THE CALCULATION OF OPTICAL CONSTANTS FOR  $\text{SiO}_2$  BY MEANS OF KRAMERS-KRONIG RELATION

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese  
Vol 5, No 3, Jun 86 pp 175-180

[English abstract of article by Su Dazhao [5685 1129 2507], et al., of the  
Department of Physics, Nankai University]

[Text] The optical constants of  $\text{SiO}_2$  are analysed according to the K-K relation in integral form by means of 170 SX-FT-IR Fourier transform infrared spectrometer. The results are satisfactory. This method has the merits both in overcoming the distortion of the spectrum of the optical constants due to the abrupt drop of the reflection spectrum in certain waverange; and in reducing the time of calculation and increasing the speed of spectrum measurement by nearly 100 percent over that by the conventional method.

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CSO: 4009/103

THE DESIGN ANALYSIS AND EXPERIMENT OF A NEW KIND OF HIGH SPEED SILICON  
VIDEO TUBE

Shanghai HONGWAI YANJIU [CHINESE JOURNAL OF INFRARED RESEARCH] in Chinese  
Vol 5, No 3, Jun 86 pp 205-211

[English abstract of article by Yang Jianlin [2799 1696 2651] of the Second  
Light Industry General Corporation of Zhuji, Zhejiang Province and Zhang  
Youwen [1728 1635 2429] of the Department of Applied Physics, Shanghai  
Jiaotong University]

[Text] By using the equivalent circuit method, the principle of the silicon  
video tube is described and the corresponding equations for transfer of  
signals are established. A qualitative analysis for the structure parameters  
of the tube is made. Based on the theory by D.K. Schroder et al. (1973) and  
BP 1387501, a more general consideration for the whole device is given and a  
new kind of tube structure is proposed. In this new tube, the response  
speed will be faster and the ability of signal storage will be larger than  
in the old one. The transference of more than 250 frames of picture per  
second would be expected.

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CSO: 4009/103

## NUCLEAR PHYSICS

### RECENT MEASUREMENTS OF TWO PHOTON MUON PAIR PROCESS FROM MARK J

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS]  
in Chinese Vol 10, No 4, Jul 86 pp 400-411

[English abstract of article by Zhang Changchun [1728 7022 2504] of the  
Institute of High Energy Physics, Academia Sinica]

[Text] The recent results from Mark J on two photon muon pair production with  $\sqrt{s}$  from 14 to 46.78 GeV are presented, and compared with the complete  $\alpha^4$  QED calculation in a large range of  $\sqrt{s}$  and four momentum transfer, including untagged, single and double tagged events. The forward-backward charge asymmetry of muons produced in the two photon process is also compared to the QED prediction.

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CSO: 4009/106

THE INFLUENCE OF EMC EFFECT ON LEPTON PAIR PRODUCTION OF HIGH ENERGY HADRON-NUCLEI COLLISION

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS] in Chinese Vol 10, No 4, Jul 86 pp 438-445

[English abstract of article by Peng Tieliang [1756 6993 2733], et al., of Beijing University]

[Text] The influence of EMC effect on Drell-Yan processes at high energies of hadron-nuclei collisions is discussed. After adapting the Jaffe's rescaling formula which express the EMC effect on deep inelastic scattering off nuclei and making use of the parton distribution function fitted by Duke and Owens, D-Y cross sections of various nuclei is calculated, which can be compared with experimental data, and it is found that the EMC effect affects these processes very little. After taking into account the disagreement between the data of EMC group and SLAC group at  $x < 0.25$ , considerable change was found but yet the data of the dependence of cross sections on the nuclei cannot be interpreted satisfactorily. It is suggested that the D-Y processes of h-A collisions at those kinematic region where the EMC effect has notable influence should be measured.

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CSO: 4009/106



A STUDY OF DEFECTS IN GaAs BY POSITRON ANNIHILATION

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS]  
in Chinese Vol 10, No 4, Jul 86 pp 459-465

[English abstract of article by Xiong Xingmin [3574 5281 3046] of the  
Institute of High Energy Physics, Academia Sinica, Beijing]

[Text] The defects in GaAs grown with the melt growth method at 1238°C and with the Te-doped LPE method in the temperature range 750-950°C are studied by positron annihilation. The lifetime component  $\tau_2$  exhibits a constant value of  $312 \pm 11$  ps in the temperature range 800-1238°C. The intensity  $I_2$  increases with the growth temperature. In the Te-doped LPE crystals, the concentration of the positron trap increases linearly with temperature. The trap is considered as Ga vacancy. The results show that doped Te in GaAs induces Ga vacancy.

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CSO: 4009/106

INVESTIGATIONS OF p-WAVE NEUTRON RESONANCE NEAR NEUTRON BINDING ENERGY

Beijing GAONENG WULI YU HE WULI [PHYSICA ENERGIAE FORTIS ET PHYSICA NUCLEARIS]  
in Chinese Vol 10, No 4, Jul 86 pp 490-496

[English abstract of article by Huo Yukun[7202.5940.2492] of Fudan University  
and Liu Jianfeng [0491.1696.1496] of Zhengzhou University]

[Text] Laser-stimulated enhancement of p-wave radiative capture of low energy neutron is studied, with aiming at investigation of p-wave neutron resonance near neutron binding energy, which cannot be observed in the usual low energy neutron induced reactions. The cross sections for such processes are calculated in second order perturbation theory and expressed in term of the intensity of laser radiation and the nuclear matrix elements. Numerical estimates show that an appreciable enhancement of the radiative capture will not be observed until the laser electric field strength reaches a magnitude of  $10^5$  to  $10^8$  (V/cm), depending whether an s-wave resonance exists simultaneously in the entrance channel.

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CSO: 4009/106

## OPTICS

### MEASUREMENT OF THE PHASE DISPERSION OF WIDE-BAND MULTI-LAYER HIGH REFLECTIVE COATINGS BY USING MULTI-BEAM INTERFERENCE

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6, No 6, Jun 86  
pp 481-486

[English abstract of article by Wo Mingzheng [3087 2404 2398], et al., of the Shanghai Institute of Optics and Fine Mechanics, Academia Sinica; received 22 October 1985]

[Text] The phase dispersion effect of intercavity elements plays an important role in the femto-second technique. This paper describes an experimental method for measuring the phase dispersion of multi-layer wide band high reflective dielectric coatings by means of multi-beam interference. The phase second derivative of reflective coatings is calculated. Experimental results show that the phase shift and the phase second derivative are closely related to the manufacturing process and design of the wide band multi-layer reflective coating.

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CSO: 4009/100

MEASUREMENT OF REFLECTIVE PHASE DISTORTION OF MULTI-LAYER THIN FILMS BY USING  
POLARIZATION HOLOGRAPHIC INTERFEROMETRY

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6, No 6, Jun 86  
pp 487-492

[English abstract of article by Li Qingxiong [2621 1987 3574], et al., of the  
Shanghai Institute of Optics and Fine Mechanics, Academia Sinica; received  
22 October 1985]

[Text] When multi-layer thin film reflectors and beamsplitters are used in  
diffraction-limited imaging systems (such as a mask projection aligner) and  
in precise interferometers, where elements mentioned above are used in cone  
beams, special attention should be paid to the phase distortion and disper-  
sion induced by these elements.

Reflective phase distributions of some specific films are calculated by using  
the well-known characteristic matrix method. It is explicated that an element  
of this kind acts as a phase distortion element with respect to the incident  
angle and as a phase dispersion element with respect to wavelength. For a  
71-layer UV wideband reflector, the phase distortion and dispersion can  
reach 3; for a 31-layer neutral reflector, 0.78; for a 6-layer prism beam-  
splitter, 0.2.

Measurement of phase distortions by means of polarization holographic  
interferometry is described in details in this paper. Information about the  
phase distortion of a whole wavefront can be obtained directly.

At the end of this paper, it is pointed out that the experimental results  
agree well with numerical analysis.

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CSO: 4009/100

## PREPARATION OF SOFT X-RAY FILTERS

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6, No 6, Jun 86 pp 493-500

[English abstract of article by Li Maolian [2621 2021 1670], et al., of the Changchun Institute of Optics and Fine Mechanics, Academia Sinica; received 30 August 1985; revised 30 December 1985]

[Text] This paper describes the principle and technology of the preparation of soft X-ray filters. Experimental results are presented. In particular, we compare the performance of Al-Mg alloy film filters with that of Al film filters. It has been found that Al-Mg alloy film filters are better than Al film filters in the capability of resisting damages caused by rocket launching.

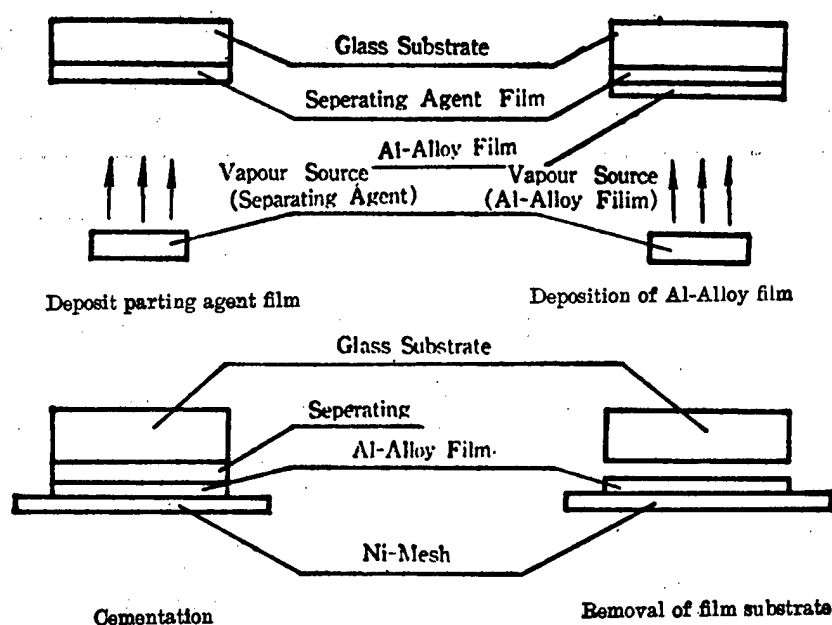


Fig. 2 Schematic diagram of the preparation of a pre-filter

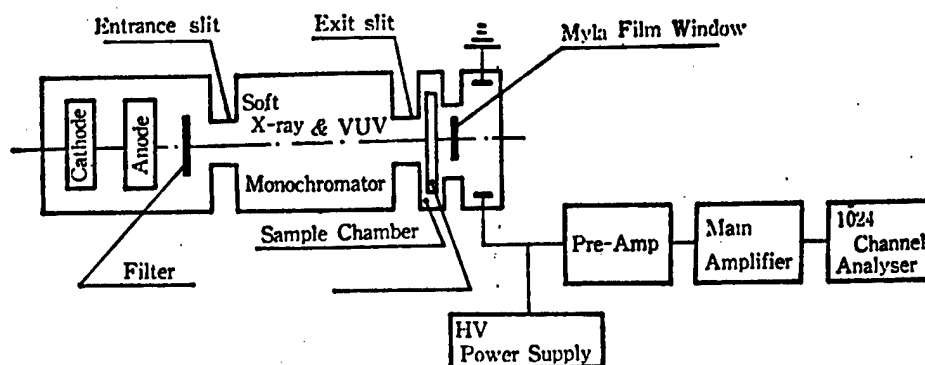


Fig. 3 Block diagram of the measuring system of soft X-ray

Table1 Comparison of performances of aluminium-magnesium alloy film filters and aluminum film filters

Type of filter		Thickness		Transmittance					Resistance to damage	
film	filter	Metal film (Å)	Plastic film (μm)	Ni mech (%)	Pinhole	Soft X-ray (%)			Noise (dB)	Vibration (g)*
						8.34 Å	13.3 Å	44.7 Å		
Al	Pre-	1500~1800		80	$10^{-7}/\text{cm}^2$	70	68	20	130	5
Al-Mg alloy		1500~1800		80	$10^{-7}/\text{cm}^2$	72	69	22	137	7
Al <sup>(1)</sup>	Primary (no mesh)	2000	1.2			90	70	13		
Al-Mg alloy		1800	1.0		$10^{-7}/\text{cm}^2$	90	73	14	131	5
Al-Mg alloy	Primary (with mesh)	1400~1800	1.0~1.5	80	$10^{-7}/\text{cm}^2$	63	45	13	137	7

\* 50~150 Hz sine wave form peak-acceleration

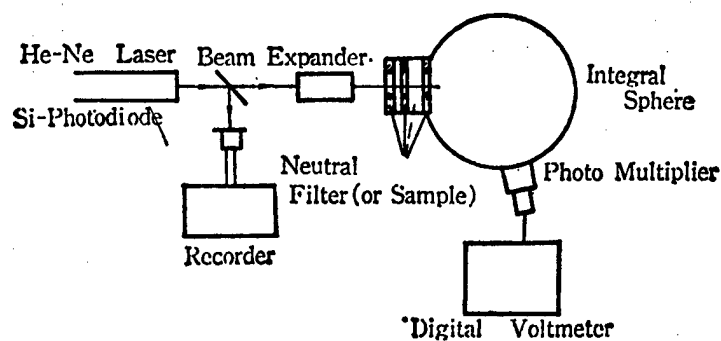


Fig. 4 Measuring apparatus of pinhole transmittance

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## A GENERAL SYSTEM FOR LASER WAVELENGTH MEASUREMENT

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6, No 6, Jun 86  
pp 532-536

[English abstract of article by Liang Peihui [2733 1014 6540], et al., of the Shanghai Institute of Optics and Fine Mechanics, Academia Sinica; received 31 October 1985; revised 20 December 1985]

[Text] In this paper we report a general system for measuring wavelengths of lasers, both CW lasers and pulse lasers. The system consists of a grating spectrometer and a one-dimension optical multichannel analyser. We use a low-density grating and operate in high-order diffraction. The distance between the He-Ne laser line and the laser line to be measured on the output spectral plane is read out in real time by the array of the OMA, the laser wavelength is then calculated by a personal computer with an error of 0.01 Å. An analysis on the error is presented.

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## A GRATING-TRIANGLE INTERFEROMETER AND ITS APPLICATIONS

Shanghai GUANGXUE XUEBAO [ACTA OPTICA SINICA] in Chinese Vol 6, No 6, Jun 86  
pp 537-542

[English abstract of article by Xu Yuguang [1776 3022 0342], et al., of the Shanghai Institute of Optics and Fine Mechanics, Academia Sinica; received 10 October 1985; revised 7 January 1986]

[Text] Triangle interferometer is the simplest ring-type interferometer. Its advantages include roughly equal optical path, high measuring accuracy and continuous shearing amount. However, its nature of shearing interference brings about complexity in quantitative investigations. If a Ronchi grating is placed in front of the triangle interferometer, optical beam is diffracted. The zero-order undiffracted beam and first-order diffracted beam are taken as the object beam and reference beam, respectively. They are combined to form interference fringes in the triangle interferometer. In this way, characteristics as a triangle interferometer remain, while interference between same points on the wavefront is realized, thus making data processing much easier. Since the two beams are very near to each other, they are able to transmit through the same optical component so that the optical system becomes simple and easily adjustable. A grating-triangle interferometer is fully competent in obtaining interferograms of laser plasmas which require a time resolution up to 10ps. Homogeneity of refractive index and thickness of ordinary transparent media can also be measured with a grating-triangle interferometer.

Interferograms of laser plasmas and Nd-glass laser rods have been obtained by using this interferometer.

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## PHYSICS

### A STUDY ON THE RELAXATION MECHANISM OF THE QUASI-POSITRONIUM

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35, No 6, Jun 86  
pp 697-703

[English abstract of article by Yang Hongning [2799 3163 1337], et al., of  
the Department of Applied Physics, Shanghai Jiaotong University]

[Text] In our theoretical approach, the relaxation mechanism of the quasi-positronium (qPs) in alkali halides has been studied. It can be shown that the electronic cloud polarization in the medium results in the screening effect on the Coulomb potential of electron-positron pairs, so as to lead to the relaxation phenomena. Because the mean distance between the electron and positron in qPs is of the order of the lattice constant in alkali halide crystal, the Toyozawa's Hamiltonian<sup>[10]</sup> in which only long range interaction between a charged particle and the medium is considered, could not be fitted in with the case of the qPs. So we try to make "the short range force correction" to the interactive Hamiltonian by using phenomenological method. Then we can solve the total Hamiltonian into the effective Hamiltonian of the qPs by means of the method which had been used to treat the exciton by Ku Shih-wei<sup>[12]</sup>. It is shown that the result of variational treatment of the effective Hamiltonian is in good agreement with the experimental data, so the relaxation mechanism of qPs can be interpreted quantitatively.

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STUDY OF THE LATTICE DEFECTS IN NiAl BY POSITRON ANNIHILATION

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35, No 6, Jun 86  
pp 704-708

[English abstract of article by Wang Tianmin [3769 1131 3046] of the Department of Physics, Lanzhou University, Michio Shimofomai and Masao Doyama of the University of Tokyo, Japan]

[Text] The structural defects, quenching defects and electron-irradiation defects in the intermetallic compounds NiAl have been studied with the positron annihilation technique. The recovery behaviour of quenching defects and irradiation defects have been investigated. Two distinct recovery stages have been found, one at about 280°C and the other at about 500°C. The experimental results show that the low-temperature stage is due to the annealing out of the divacancies and the high-temperature stage is due to the annealing out of the vacancies; and the density of the conduction electrons at the vacancies and the lattice interstitial sites are nearly equal to each other, but the momentum of the conduction electrons at the vacancies is lower than that at the lattice interstitial sites in NiAl.

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# A NEW EPR SPECTRUM IN NEUTRON IRRADIATED SILICON CONTAINING HYDROGEN

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35, No 6, Jun 86  
pp 716-724

[English abstract of article by Lin Xulun [2651 4872 0243] of the Department of Physics, Peking University]

[Text] The n-type FZ silicon ( $P \sim 10^{14}/\text{cm}^3$ ) grown in hydrogen is irradiated with neutrons of the total flux of  $(2.9-6.0) \times 10^{17} \text{ n/cm}^2$  and with Cd ratio about 10 at room temperature. An  $S = 1/2$  EPR spectrum, labeled Si-PK2, is found in X band and at 77K. The angular dependence of the  $g_{\text{eff}}$  values with H in the (011) plane has a triclinic symmetry.

For one of the equivalent defect orientations the principle values of the g tensor and the direction cosines of the principle axes with respect to the cubic axes are as follows:

$g(\pm 0.0004)$	$n[100]$	$n[010]$	$n[001]$
$g_1 = 2.0028$	-0.5154	0.8473	-0.1283
$g_2 = 2.0063$	-0.7386	-0.5151	-0.4347
$g_3 = 1.9971$	-0.4344	-0.1293	0.8914

The simulated EPR spectra computed from the g tensor are consistent with the experimental results.

The PK2 EPR spectrum appears in the unannealed neutron irradiated samples and remains until 300°C annealing. It is probably due to a kind of defects which is dependent of the hydrogen.

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EFFECTS OF BONDED HYDROGEN ON THE PHOTOLUMINESCENCE PROPERTIES OF GD a-Si:H THIN FILMS

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35, No 6, Jun 86 pp 725-730

[English abstract of article by Ma Honglei [7456 3163 4320], et al., of the Department of Physics, Shandong University, Jinan]

[Text] The photoluminescence spectra and optical absorption spectra were measured for GD a-Si:H films prepared at different substrate temperatures. It is found that increasing bonded hydrogen content results in a systematic increase of the photoluminescence peak intensity, peak energy, linewidth, Stokes shift, and thermal quenching. From the experimental results we infer that:

- (1) The bonded hydrogen may generate radiative recombination centers as well as may remove non-radiative recombination centers;
- (2) The increase of the bonded hydrogen content results in increase of the electron-phonon interaction and a slight reduction in the band tail width.

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CSO: 4009/101

CRACKING DUE TO EIGEN STRAINS OF A CIRCULAR INCLUSION IN CERAMIC MATERIALS

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35, No 6, Jun 86  
pp 750-761

[English abstract of article by Cao Baohong [2580 1405 1347] and Zhang Hongtu  
[1728 1347 0956] of the Department of Materials Science, Lanzhou University]

[Text] The microcracks caused by the transforming inclusions associate closely with the mechanism of fracture and toughness in ceramic materials. Exact analytical expressions for dislocation density, opening displacement and stress intensity factors of microcracks in the matrix, caused by a circular transforming inclusion, have been derived by using dislocation theory method. The results obtained have been analyzed and discussed.

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STUDIES OF FREQUENCY SPECTRUM OSCILLATING PHENOMENON OF FREE ELECTRON LASER  
AMPLIFIER

Beijing WULI XUEBAO [ACTA PHYSICA SINICA] in Chinese Vol 35, No 6, Jun 86  
pp 792-796

[English abstract of article by Jiang Huabei [5592 5478 0554] of the  
Institute of Microwave Electronics, Chengdu Institute of Radio Engineering]

[Text] In this paper, on the basis of a single-particle model, the dispersion equation is obtained after considering the first perturbation term of relativistic energy factor. The results show that the frequency spectrum of free electron laser amplifier (FELA) exhibit oscillating phenomenon when injected electron energy is large enough. The origin of this phenomenon is attributed to perturbing effect of the relativistic energy factor. A somewhat detailed discussion is given.

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CSO: 4009/101

GROWTH OF  $\text{ZnS}_x\text{Se}_{1-x}$  SINGLE CRYSTALS AND IDENTIFICATION OF BOUND-EXCITON SPECTRA LINES

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 7, No 1, Jan 86 pp 1-9

[English abstract of article by Huang Ximin [7806 6932 3787] of Changchun Institute of Physics, Academia Sinica]

[Text] High-purity  $\text{ZnS}_x\text{Se}_{1-x}$  ( $0 < x < 0.125$ ) single crystals have been grown by sublimation method. The distribution of sulphur in  $\text{ZnS}_x\text{Se}_{1-x}$  single crystals is uniform.

$I_1^{\text{deep}}$  line and its LO-phonon replicas, observed in photoluminescence of  $\text{ZnS}_x\text{Se}_{1-x}$  ( $0.02 < x < 0.125$ ) single crystals at 2 K have been identified using the excitation spectroscopy and the selectively excited photoluminescence, and using back-doping and annealing method in molten Zn. The changes of

$I_1^{\text{deep}}$  and its LO-phonon replicas with the increasing of composition  $x$  are as follows: (a) the spectra lines become broader; (b) the energy spacing between  $I_2$  and  $I_1^{\text{deep}}$  becomes larger; (c)  $I_1^{\text{deep}}$  becomes weaker, on the contrary LO-phonon replicas become stronger. These phenomena are considered to be due to the fact that the energy level of the neutral acceptors responsible for the  $I_1^{\text{deep}}$  line becomes deeper with the increasing  $x$ . The change of phonon coupling coefficients with the change of  $x$  in  $\text{ZnS}_x\text{Se}_{1-x}$  system have been observed. (Paper received 31 Dec 84.)

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# DETERMINATION OF THE CRYSTALLITE SIZE OF POLYCRYSTALLINE Si BY THE METHOD OF FOURIER ANALYSIS FROM X-RAY DIFFRACTION LINE BROADNESS

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 7, No 1, Jan 86 pp 18-23

[English abstract of article by Lin Zhenjin [2651 2182 6855], et al., of Beijing Normal University]

[Text] By using the X-ray diffraction line broadness effect, we measured the crystallite sizes of polycrystalline Si in CVD layer. During the growth of the CVD polycrystalline Si, there are macro-micro strains. In order to gain the value of the mean crystallite dimension accurately, we separate the broadness of the diffraction line into two parts one is size broadness and the other is lattice strain. The results corrected and uncorrected by fourier series method have been compared and the difference between them is about more than 22 percent. Finally, we applied the method to investigate the ion implanted samples treated in different annealing conditions. (Paper received 29 Oct 84.)

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# A METHOD OF CALCULATING THE MINORITY CARRIER LIFETIME AND RECOMBINATION VELOCITY OF SEMICONDUCTOR WAFERS

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 7, No 1, Jan 86 pp 33-41

[English abstract of article by Wang Zongxin [3769 1350 2946] and Chu Youling [5969 1635 0109] of Fudan University]

[Text] A new solution of minority carrier diffusion equation is described. The numerical results show that it is enough to express the decay curve of minority carriers with the sum of the first mode and the second mode. Using the expression of the first mode and the second mode, we can calculate the recombination velocity and the true bulk lifetime. The method is simple and convenient. It is useful for the minority carrier lifetime measurement of semiconductor wafers. (Paper received 10 Jan 85.)

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# STUDY OF IR ABSORPTION AND CONTENT MEASUREMENTS OF CARBON IN GaAs AT ROOM TEMPERATURE

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 7, No 1, Jan 86 pp 59-64

[English abstract of article by Jiang Desheng [3068 1795 3932], et al., of Institute of Semiconductors, Academia Sinica]

[Text] Temperature dependence of carbon-induced localized vibration mode (LVM) IR absorption are studied and changes of lineshape, frequency position and absorption intensity of the LVM absorption band are observed. It is shown that the half-width of the Lorentzian line-shaped absorption band is quite narrow (about  $1\text{ cm}^{-1}$ ), which is mainly determined by the nearest-neighbor effect of Ga isotopes as the disappearance of the fine structure of the LVM absorption band at room temperature due to temperature broadening of absorption lines. From this experimental indication, a method is described for measuring carbon content in GaAs at room temperature. In addition, the carbon content of LEC GaAs single crystals with different growth conditions is also studied and discussed. (Paper received 21 Jan 85.)

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## A DLTS STUDY OF THE DEEP LEVELS IN PLATINUM DOPED SILICON

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 7, No 1, Jan 86 pp 85-88

[English abstract of article by You Zhipu [3266 1807 2613], et al., of Department of Physics, Sichuan University]

[Text] The energy levels produced by platinum in silicon have been measured using deep level transient spectroscopy (DLTS). Five kinds of Pt doped samples have been prepared. They are  $p^{+}nn^{+}$  deep junctions,  $P^{+}n$  or  $n^{+}p$  shallow junctions, and Au/n-Si Schottky or Ti/p-Si Schottky. By analyzing the results from different samples it has been concluded that the  $E_c0.34\text{eV}$  level which was previously reported in  $p^{+}nn^{+}$  deep junctions does not exist in N type silicon. This DLTA peak originates from the hole emission on the P side of  $p^{+}nn^{+}$  junction. (Paper received 12 Jan 85.)

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# A NEW TRICLINIC DEFECT IN NEUTRON-IRRADIATED FZ-SILICON GROWN IN HYDROGEN

Beijing BANDAOTI XUEBAO [CHINESE JOURNAL OF SEMICONDUCTORS] in Chinese Vol 7,  
No 1, Jan 86 pp 109-112

[English abstract of article by Wu En [0702 1869], et al., of Department of  
Physics, Peking University]

[Text] A new triclinic defect, labeled Si-PK1, was observed first with EPR in  
neutron-irradiated FZ-silicon grown in hydrogen, the paramagnetic parameters of  
this defect were determined. The pattern computer calculated with these parame-  
ters was found to be in close agreement with the experimental data. (Paper  
received 16 Jul 85.)

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